

In-Situ Water Vapor Probe for a Robot Arm-Mounted, Compact Water Vapor Analyzer

Completed Technology Project (2012 - 2013)



Project Introduction

This instrument could be utilized in both manned and unmanned missions to a wide range of high priority NASA mission targets including Mars, the Moon, and Near Earth Objects. It also can serve as a key component of an ISRU instrument package - providing in-situ prospecting. The applicability of this project to both science and ISRU makes this proposal directly responsive to the "New Tools of Discovery" and to the "Space Colonization" Grand Challenges. It is a novel technology that will be an essential tool in discovering the origin and abundance of water in the solar system. The discovery and understanding of H₂O deposits throughout the solar system is a critical component of self-sufficient human settlement.

We propose to test a prototype water vapor sampling end-effector in the laboratory and in the field that will eventually be integrated with a small, infrared spectrometer developed through SBIR phase II funding for lunar, asteroid, or Martian exploration. The analyzer is capable of in-situ analysis of water-bearing materials on a millimeter scale providing high precision measurements of water abundance and isotopic composition. The high precision isotopic analysis will include D/H, ¹⁷O/¹⁶O, and ¹⁸O/¹⁶O. Water is central to NASA's strategic goals for exploration of the solar system and high precision isotopic analysis, especially of ¹⁷O, provides a key tool in answering fundamental scientific questions about its origin and history. In addition, these measurements can serve as an important component of ISRU operations helping to identify, characterize, understand, and predict the occurrence of volatile deposits.

Anticipated Benefits

Testing of basic underlying physico-chemical processes (KA) in lab and in field

- Integration with analyzer developed by Vista Photonics (SBIR Phase II)
- Collection of a data set enabling proposal to PIDDP or MATISSE



Project Image In-Situ Water Vapor Probe for a Robot Arm-Mounted, Compact Water Vapor Analyzer

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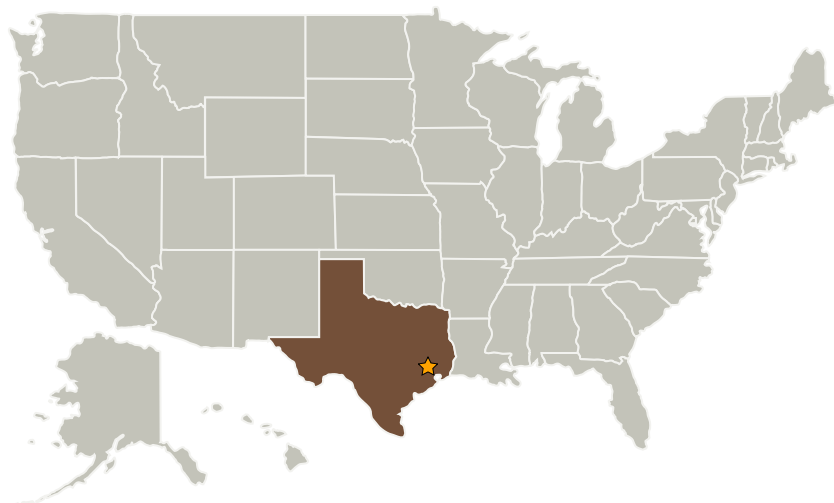
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Carlos H Westhelle

Project Manager:

Paul B Niles

Principal Investigator:

Paul B Niles

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Images



12093-1377029871801.jpg

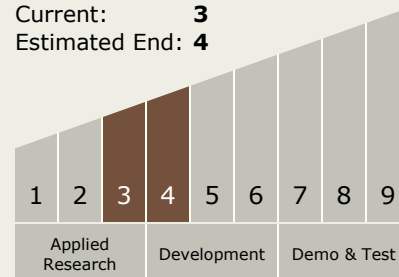
Project Image In-Situ Water Vapor Probe for a Robot Arm-Mounted, Compact Water Vapor Analyzer
(<https://techport.nasa.gov/image/2242>)

Links

NTR 1
(no url provided)

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - TX07.1 In-Situ Resource Utilization
 - TX07.1.1 Destination Reconnaissance and Resource Assessment